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COUNTERING THE NUCLEAR TERRORIST THREAT

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Nuclear/Radioactive (N/R) Terrorist Threats

The nuclear/radioactive threat to homeland security posed by terrorists can be broken into four categories. Of highest concern is the use of an improvised nuclear device (IND).
An IND, as its name implies, is a nuclear explosive device. It produces nuclear yield, and this nuclear yield has catastrophic effects. An IND is the ultimate terrorist weapon, and terrorist groups are actively attempting to acquire nuclear weapons. Detonation of an IND could dwarf the devastation of the September 11 attack on the World Trade Center.

Dealing with the aftermath of an IND would be horrific. Rescue efforts and cleanup would be hazardous and difficult. Workers would have to wear full protection suits and self-contained breathing apparatus. Because of the residual radioactivity, in certain locations they could only work short times before acquiring their "lifetime" dose. As with the Chernobyl event, some rescue workers might well expose themselves to lethal doses of radiation, adding to the casualty toll. Enormous volumes of contaminated debris would have to be removed and disposed.

If a terrorist group decides not to pursue an actual nuclear device, it might well turn to Radiological Dispersal Devices (RDDs) or "dirty bombs" as they are often called. RDDs spread radioactivity but they do not generate nuclear yield. The fabrication of an RDD requires radioactive material and a dispersal mechanism. Radioactive materials are used all over the world for medical, industrial, and research applications. Standards for safe handling and accountability of radioactive material vary around the world. Stories in the press suggest inadequate controls on radiological materials in parts of the world.

The effects of an RDD vary widely, and are measured in terms of contamination area, health effects to the exposed population, and economic consequences. Even a negligible, but measurable, exposure would exploit the general public's fear of things radioactive and would have significant psychological consequences. The greatest impact of a small release would probably be economic, associated with cleanup and restoration of the contaminated area.

Another category of threat is the attack on a facility, either a power reactor or sabotage of a large radiation source. In general these facilities are hard targets (structurally), and damage and contamination are localized.

The final category of threat is the use of radioactive materials to deliver a radiation dose to individuals. This type of attack is again localized and does not readily fall into the category of a weapon of mass destruction.

Multilayered Defense against INDs and RDDs

What can we do to protect against terrorist acquisition and use of INDs and RDDs? As with every other aspect of the terrorism problem, there is no silver bullet. A layered strategy is required, addressing the various stages on this threat.

Weapons and Material Protection. Since acquiring nuclear materials is a prerequisite to the fabrication of an IND, first and foremost we must protect nuclear weapons and special nuclear material. Extensive safeguards are in place in the U.S. to protect weapons-usable nuclear materials; security at weapon storage sites is rigorous. The National Nuclear Security Administration's (NNSA's) Material Protection, Control, and Accounting (MPC&A) program is making essential enhancements to the security of nuclear materials at dozens of sites across Russia.

In considering radiological and nuclear facilities, two threats need to be considered. One is the theft of materials by terrorists, and the other is attack on a facility to disperse radiological or nuclear materials. Facilities may include reactors as well as waste and storage areas. A high-level risk assessment should be performed on radiological and nuclear facilities to provide an integrated view of vulnerabilities. Such a high-level assessment and analysis of proposed controls, including additional research and development needed for protection would supplement and update current assessments. This summary assessment and corresponding recommended measures should be distributed to appropriate agencies and facilities for implementation.

The September 11 terrorists clearly demonstrated considerable technical innovation, excellent operational security, and extensive financial backing. We should therefore conduct enhanced threat assessments that include some threats beyond the current design basis threat. These outside-the-box threats should be analyzed for high-risk or strategic potential targets, based upon likelihood and consequence. The results would be used to guide intelligence gathering and enhance protection of sites and facilities.

Indications and Warning. As always, accurate and timely intelligence is critical. The September 11 attacks demonstrated the extraordinary difficulty of this task, particularly when faced with a diffuse organization that practices excellent operational security. We must be alert to signatures of terrorist IND activities. Significant indicators may be available but difficult to identify, either because they are embedded in massive quantities of background information or because it is difficult to share analysis results among different user communities. Improvements in data mining/extraction techniques will offer important advances in the out-years.

Terrorists formulate their own attack plans and strike where and how they choose. However there are constraints involving design, materials, and fabrication that must be met in order to produce a terrorist weapon. Increased international cooperation could help to combat nuclear smuggling. Mining of the existing nuclear smuggling database to identify linkages (prior scams, materials, regions, intermediaries, etc.) could provide early indications of a terrorist group attempting to go nuclear.

Search and Interdiction. We need to be able to detect and intercept INDs and RDDs before they reach their target, preferably close to their source. This element alone requires layers within layers. The DOE Second Line of Defense (SLD) program is assisting Russia's State Customs Committee in detecting and intercepting illicit traffic in nuclear materials, equipment, and technology across the 35,000 miles of Russia's borders. Information from this and similar efforts should be used to enhance existing nuclear smuggling databases, providing linkages among prior scams, materials, regions, and intermediaries.

Protection at borders or ports of entry should be enhanced. Maritime shipping is a particular concern. Technology can play an important role here, with improved detectors at border crossings and "smart" transportainers with built-in nuclear, chemical, and bioagent detectors. The technical community is exploring improvements in port security, including building test beds for cargo container technology and detectors.

Although the problem of complete protection for large metropolitan areas remains difficult, it is possible to install correlated sensor networks around key facilities and approach routes. Prototype systems have been studied, developed, and shown to work. These prototypes will help lay the groundwork for development of effective approaches for more complex deployment. Multiple organizations are be engaged in these efforts; communication regarding these activities will be essential.

Crisis Response. Should we fail to intercept a terrorist IND or RDD, the next layer of defense is crisis response. Emergency response teams must locate the device and render it safe. An established U.S. capability exists, the Nuclear

Emergency Search Team or NEST. NEST capabilities include search and identification of nuclear materials, diagnostics and assessment of suspected nuclear devices, technical operations in support of render-safe procedures, and packaging for transport to final disposition.

In the current threat environment, emergency response teams take on a more critical role. Funding for research and development needs to keep pace with the changing threat environment. Also, additional personnel must to be recruited and trained.

Consequence Management. In the event of a nuclear event, consequence management assets would be deployed. The NNSA has an established capability for predicting the transport and dispersion of materials released into the atmosphere, including radionuclides. Most important here is knowledge about the probable transport and distribution of prompt effects (blast, thermal, radiation) and delayed effects (fallout). The Atmospheric Release Advisory Capability (ARAC) is an emergency response service for real-time assessment of incidents involving nuclear, chemical, biological, or natural hazardous material. Since it was established in 1979, ARAC has responded to more than 70 alerts, accidents, and disasters (including Cosmos 954, Three Mile Island, and Chernobyl) and supported hundreds of emergency response exercises. Emergency managers use ARAC plots to develop the best response strategy for minimizing hazards to life or health and property damage in affected regions.

Efficient emergency response will require a capability for promptly predicting the dose to the population as a function of location relative to ground zero and time after the explosion. Such a capability is also essential for rescue teams and others who must enter the contaminated area. Responders need to be advised of internal and external exposure to all radionuclides. Local inhabitants need to be advised of material deposited on the ground and instantaneous and time-integrated doses.

Decontamination procedures, including a framework for assuring public confidence in the adequacy of cleanup, need to be exercised and vetted. Incident site monitoring capabilities may require enhancement.

A mechanism to ensure that decision-makers are familiar with the Radiological Emergency Response Plans should be developed and implemented. A protection guide for the public needs to be developed because written guidance addressing a terrorist event is negligible. Plans are also needed to prepare for a large-scale incident requiring long-term deployments of personnel (potentially at multiple locations) and significant laboratory analytical capabilities.

Attribution. The final layer of defense against terrorist use of INDs and RDDs is the threat of retaliation. Effective retaliation requires accurate attribution of the device—its nuclear materials and design as well as the perpetrators and their suppliers, intermediaries, and sponsors. A key technical component is forensic analysis of post-detonation debris. The technical community should work to enhance the timeliness of the current attribution capability. A related need is the development of a comprehensive forensic-type database of nuclear materials worldwide.

Conclusions

Terrorist acquisition and use of an IND against the U.S. is a low-probability but high-consequence threat. The use of an RDD is a higher probability but lower consequence event. As September 11 so chillingly demonstrated, today's terrorists are technically innovative and resourceful, financially well supported, actively attempting to acquire weapons of mass destruction, and intent on causing mass casualties and wide-scale devastation

Let me note that important elements of a layered defense against the threat of terrorist INDs and RDDs are already in place. Coordination among the many agencies involved in counterterrorism is improving and continues to be vital. However with such a complex problem, more needs to be done.

We must protect the key materials for fabricating an IND—full-up weapons, weapon pits, plutonium, and enriched uranium—both in the U.S., in Russia, and in the rest of the world.

We must watch for signatures of individuals or groups attempting to obtain materials or components of INDs.

Last but most important, we must make a sustained investment in the science and technology needed to win the war on terrorism. Programs in nonproliferation, proliferation detection, counterterrorism, and homeland security are closely linked and must not be selected "either/or" or conducted in isolation from each other.

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